

WE CLAIM:

- 1                   1.    A varactor comprising:  
2                   a silicon layer;  
3                   a P- well in the silicon layer;  
4                   first and second N+ regions in the silicon  
5 layer, wherein the first N+ region forms a first N+/P-  
6 junction with the P- well, and wherein the second N+  
7 region forms a second N+/P- junction with the P- well;  
8                   a gate oxide above the P- well; and,  
9                   a silicon gate above the gate oxide.
- 1                   2.    The varactor of claim 1 wherein the  
2 silicon gate comprises a polysilicon gate.
- 1                   3.    The varactor of claim 1 wherein the  
2 silicon layer is formed over an insulation layer so that  
3 the silicon layer and the insulation layer together form  
4 an SOI structure.
- 1                   4.    The varactor of claim 3 wherein the  
2 insulation layer is formed over a layer of high  
3 resistivity silicon.
- 1                   5.    The varactor of claim 1 wherein the  
2 silicon layer is formed from bulk silicon.

1           6.    The varactor of claim 1 wherein the  
2 silicon layer is formed over a sapphire layer so that the  
3 silicon layer and the sapphire layer together form an SOS  
4 structure.

1           7.    The varactor of claim 1 wherein the P-  
2 well forms a transistor body, and wherein the transistor  
3 body is allowed to float.

1           8.    The varactor of claim 1 wherein the gate  
2 silicon has a width to length ratio of approximately 16  
3 to 1.

1           9.    The varactor of claim 1 further comprising  
2 a first metallization coupled to the gate silicon and a  
3 second metallization coupled to the N+ regions.

1           10.   The varactor of claim 1 wherein the first  
2 and second N+/P- junctions extend from a top surface to a  
3 bottom surface of the silicon layer.

1           11.   A varactor comprising:  
2 silicon layer;

3 a plurality of alternating P- wells and N+  
4 regions in the silicon layer, wherein each P- well forms  
5 a first N+/P- junction with the N+ region on one side of  
6 the P- well and a second N+/P- junction with the N+  
7 region on the other side of the P- well;  
8 a gate oxide above each of the P- wells; and,  
9 a silicon gate above each of the gate oxides.

1 12. The varactor of claim 11 wherein the  
2 silicon gate above each of the gate oxides comprises a  
3 polysilicon gate above each of the gate oxides.

1 13. The varactor of claim 11 wherein the  
2 silicon layer is formed over an insulation layer so that  
3 the silicon layer and the insulation layer together form  
4 an SOI structure.

1 14. The varactor of claim 13 wherein the  
2 insulation layer is formed over a layer of high  
3 resistivity silicon.

1 15. The varactor of claim 11 wherein the  
2 silicon layer is formed from bulk silicon.

1           16. The varactor of claim 11 wherein the  
2 silicon layer is formed over a sapphire layer so that the  
3 silicon layer and the sapphire layer together form an SOS  
4 structure.

1           17. The varactor of claim 11 wherein the P-  
2 wells form a transistor body, and wherein the transistor  
3 body is allowed to float.

1           18. The varactor of claim 11 wherein each of  
2 the gate silicons has a width to length ratio of  
3 approximately 16 to 1.

1           19. The varactor of claim 11 further  
2 comprising a first metallization coupled to the silicon  
3 gate above each of the gate oxides and a second  
4 metallization coupled to each of the N+ regions.

1           20. The varactor of claim 11 wherein each of  
2 the N+/P- junctions extends from a top surface to a  
3 bottom surface of the silicon layer.

1           21. A method comprising:  
2           forming a plurality of alternating P- wells and  
3 N+ regions in a silicon layer such that each P- well

4 forms a first N+/P- junction with the N+ region on one  
5 side and a second N+/P- junction with the N+ region on  
6 the other side;

7 forming a plurality of gate oxides, wherein  
8 each of the gate oxides is formed above a corresponding  
9 one of the P- wells;

10 forming a plurality of silicon gates, wherein  
11 each of the silicon gates is formed above a corresponding  
12 one of the gate oxides;

13 electrically coupling each of the silicon gates  
14 together; and,

15 electrically coupling each of the N+ regions  
16 together.

1 22. The method of claim 21 wherein each of the  
2 silicon gates comprises a polysilicon gate.

1 23. The method of claim 21 further comprising  
2 forming the silicon layer over an insulation layer so  
3 that the silicon layer and the insulation layer together  
4 form an SOI structure.

1 24. The method of claim 23 further comprising  
2 forming the insulation layer over a layer of high  
3 resistivity silicon.

1                   25. The method of claim 21 wherein the silicon  
2 layer comprises a bulk silicon layer.

1                   26. The method of claim 21 further comprising  
2 forming the silicon layer over a sapphire layer so that  
3 the silicon layer and the sapphire layer together form an  
4 SOS structure.

1                   27. The method of claim 21 wherein the P-  
2 wells form a transistor body, and wherein the transistor  
3 body is allowed to float.

1                   28. The method of claim 21 wherein each of the  
2 silicon gates is formed so as to have a width to length  
3 ratio of approximately 16 to 1.

1                   29. The method of claim 21 wherein each of the  
2 N+/P- junctions extends from a top surface to a bottom  
3 surface of the silicon layer.

1                   30. A varactor formed by a MOS transistor  
2 structure and having a capacitive switching ratio equal  
3 to or greater than 5.

4